Fuse Making

2003-08-09

This page used to be a long whine about how hard it is to make reliable thin fuses. I've rewritten it to contain more useful information, with practical use types you can make. I normally only use blackmatch, quickmatch, and my meal-NC variation on cracker fuse, but the other variations have their own odd uses. I don't have access to visco, so I have to make all my own ignition materials. It isn't as hard as it sounds, I have a roughly monthly match making day where I make a batch large enough to last me until the next one, I find it relaxing.

Blackmatch

Blackmatch is simply a paste of meal powder and around 5% dextrin coated onto cotton string. There are several variations, including using multiple strands of cotton to enclose more powder, and many ways to actually make it.

Some production methods are more suited to hobby use than others, the medium-large scale production method using continuous pulling of cotton thread through a meal soup and winding it onto a drying frame can churn out 200 metres of match in only an hours work, which is probably enough to last a hobbyist for years. I personally make my blackmatch in 1 metre lengths, 5-20 metres in a session, which is usually enough to last me a few weeks:

I take my ball milled blackpowder meal (the higher quality the better) weigh out a few table spoons full and add 5% dextrin then mix it well using the ball mill for a few minutes. Next I add sufficient water to make a paste, about the consistency of yoghurt. An alternative is to use syrupy gum arabic solution and forgo the addition of the dextrin, this makes a superior strength match, but it burns a little slower. Additionally (and this is the true secret to the robustness of my blackmatch) I add a teaspoon of sloppy paper pulp for every 2 table spoons of meal. The paper pulp is just kraft paper (even recycled) pulped in a blender with a cup of hot water.

Next I cut off a metre length my 100% cotton yarn (about 0.7 mm in diameter), coil it loosely around 2 fingers and dunk it into the meal paste. I use a bamboo skewer to stir it around and make sure it is really well soaked. I then locate one end of the string and pull it out of the mess through a sizing die (a hole in a piece of plastic about 2 mm in diameter). This knocks of any excess paste and untangles the string at the same time. Be careful not to strip off all the paste if your string is badly tangled.

You can use any length you like, but 1 metre is about all I can comfortably handle with the jar sitting the in sink and myself standing on tip-toes. It is best if you don't handle the wet match. You can at this point hang it up to dry if you wish, you will have a thin and fairly reliable stick of blackmatch, but I prefer an additional quick step that makes it a better match and makes it easier to handle as it dries.

My final step is to have another plastic jar with a few table spoons of dry meal in it waiting on the bench. I simply coil the wet match into the jar, screw on the lid and shake for about 5 seconds. The dry meal will form a thick coating over the wet match, which you can size again using the die, or just gently pull it through your fingers as you remove it to knock off any dags. It should be at least 2 mm in diameter.

I hang my match to dry with clothes pegs. You can tell when it is getting close to dry as it stiffens and will swing like a solid rod. Once it is solid you can take it down and size it (reduces crumbling at the cut point as it is still slightly moist in the core) if you wish, but I usually just let it hang for a day or more. Don't be disappointed if you match doesn't burn well after only a few hours of drying. Give it a full day or two and the true performance will appear.

Quickmatch

Quickmatch is simply blackmatch threaded through a narrow paper pipe. The confinement of the combustion gases accelerates the flame front down the match, it can exceed 100 metres per second in good quickmatch. I spiral roll my match pipe from recycled kraft, the kind sold for wrapping parcels. It is very

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takes only a minute or so per length. For short lengths and quicky projects (say the passfire on a saxon or tourbillion) lengths of polymer soda straw are usable, but tend to melt and make a bloody horrible mess.

Cracker Fuse

Also known as chinese twisted fuse, or chinese cracker fuse. It is a twisted tissue paper fuse containing a thin trail of blackpowder meal or meal D granules. It has a well deserved reputation for skipping lengths and holdfiring, which makes it basically unsuitable for timing and dangerous for its most common 1.4G use; ground salute fuses!

It is more time consuming to make than blackmatch, but can be made largely water-proof by lacquering. It is much less fragile than blackmatch and can be

A strip about 100 mm wide is cut to the desired length, and then wound with around a 30 degree pitch on an 5 or 8 mm OD dowel. A drop of gum arabic, PVA, or flour paste is used to tack the loose end, then the entire pipe is painted lightly with the paste. I normally just dunk my fingers into the paste and coat the pipe by hand rather than using any kind of brush. I then hang the pipe to dry using the same tiny plastic clothes pegs I use for the blackmatch.

Some people roll Aluminium foil into the pipe to protect it from unwanted ignition sources. I've never had this problem, the pasted tube is quite robust, especially because of the fairly gentle winding pitch. You get a feel for the right pitch/thickness with experience, it isn't hard to do,

made fairly reliable even at small diameters. Most importantly it carries fire through narrow holes much more reliably than equally thin blackmatch.

I've never been able to master the rolling technique that I've seen Chinese workers use. I believe a lot of their success is in the special paper they use, somewhere in between crepe, tissue, and kitchen wrap. Ideally you moisten your work surface and the paper, lay down a meal trail, then pick up a corner and roll the entire length in a single smooth action! It is truly amazing to watch a master of the art. My solution is (using kitchen wrap paper, after moistening and laying the powder) to fold the paper down the middle then pick it up and twist from one end to the other.

I often give it a quick wipe over with PVA on my fingers to help keep it from unravelling. Some starch in the moistening water was used once with good effects. You can dip it in nitrocellulose lacquer if you want it water-proofed. The thicker you lay down the powder the more reliable it will be.

Sticky Match

I believe the term "sticky match" is actually a trade marked product in Australia, perhaps world-wide. Essentially it is a blackpowder grain trail sandwiched between transparent plastic tape. The over-tape is generally wider than the under-tape so it is still sticky. I've made a "sticky match"-like product using your average adhesive tape and rough powder/pulverone. There appears to be no need for it to be true corned BP, although greenmix pulverone sucks, it needs to be at least half-hour meal that has been granulated through a 20 mesh screen, bound with a little dextrin. I haven't tried KP or H3, but I see no reason why they wouldn't work. I've read of people using flash but that seems an expensive and overly dangerous way to go.

You don't need to use transparent tape, even masking tape, or that horrible brown stuff that sells for 20 cents a roll will work. I prefer the transparent tape so I can see any voids or other problems while using it.

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I don't use it very much myself, it is included here mainly for completeness. I find making it more painful than rolling match pipe. I might change my mind if I made a jig for its production like Dan Williams has. I've found using a single wide tape and laying the granules down one edge, then folding the remaining tape over it at the 1/3 point is a fairly rapid technique. It leaves you with half powder core on one side, half sticky tape on the other.

A Few Variations

The skip and hold problems of chinese cracker fuse can be mostly cured by making the match up with a paste of meal rather than dry powder or granules. I've tried using dextrin bound meal, it works quite well but takes a long time to dry. My favorite, and most commonly used 'delay' fuse, is made this way, but using nitrocellulose lacquer to make a paste of the meal. It is a messy process, but it makes an excellent fuse. I fold the dry tissue in half down the centre, then run a trail of paste about 2 mm deep into the vee, give it a chance to start bonding with the paper (about 10 seconds), then I twist it up just like I would the normal chinese fuse.

Another variation of the meal-NC composition is to paint it onto a sheet of paper (only needed on one side) and allow it to dry. You can then cut strips as long and as wide as you like. These work well for fusing gerbs or candles, anything with a wide mouth, or just use them for quick composition tests. It is quite probably the easiest fuse in the world to make, especially if you have a large paper cutter. The coating can flake off if too little acetone is used or the paper is bent too much, but it is a bit more robust than conventional blackmatch.

I've made a batch or two of 'effects blackmatch', which is a blackmatch made from a composition containing Zinc dust. You can substitute the Zinc for Iron or Aluminium (or maybe even Titanium, but I haven't tried that) for different effects. You simply ball mill the ingredients for an hour or more sans the metal, then screen in the metal of choice with a 60 mesh screen. The composition is:

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17 Potassium Nitrate
7  Zinc dust (or other metal of choice)
3  Sulfur
4  Charcoal (airfloat)
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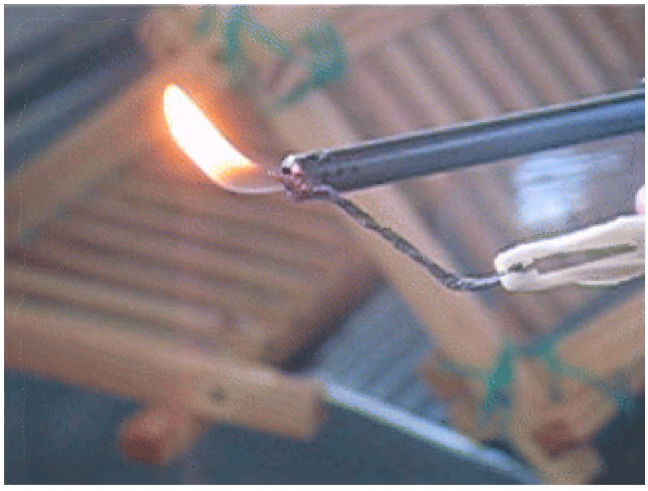
Effects blackmatch is also fairly good at lighting tougher compositions, like those that are rich in metals or resins.



A final variation is my hot, splattering, killer fuse. I don't really have a good name for it, I don't use it much because it is lethally fast about 4 inches a second, but it burns very hot with a white flame envelope and throws 4 inches of orange sparks in all directions. It can ignite very stubborn compositions and the composition is very cheap:

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70 Potassium Nitrate
15 Charcoal (airfloat)
8  Maltodextrin
6  Sulfur
4  Iron Oxide (red)
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Ball mill it for around 1 hour for a good fuse, 3 or more hours for a deadly fast fuse that is self propelled and could probably be used as fish/serpents if you wrapped it in tape or a piece of match pipe to inhibit the sides (cracker fuse makes a jerky darting fish too but it *must* be primed with meal-NC on one end). I normally make a paste of the composition with water and alcohol (50:50). Then I dunk a 10 mm wide by however long piece of kitchen wrap. After swirling it around in the paste it is extracted and twisted into shape. It is a very nice red-brown colour, unmistakable from regular fuse.

6 comments.

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